Features

- Saturated Power: 55 W
- Drain Efficiency: 62%
- Small Signal Gain: 19 dB
- DFN 3 x 4 12 L Plastic Package
- RoHS* Compliant

3 x 4 mm PDFN-12LD

Applications

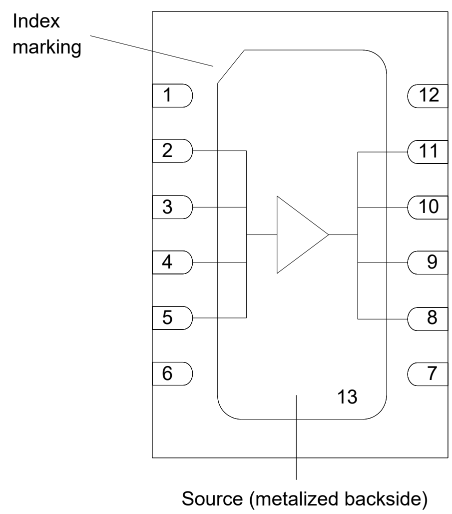
- Avionics - TACAN, DME, IFF
- Military Radio
- L-Band Radar
- Electronic Warfare
- ISM
- General Amplification

Description

The MAPC-A3029-AD is a 55 W packaged, unmatched transistor utilizing a high performance, GaN on SiC production process. This transistor supports both defense and commercial related applications.

Offered in a thermally-enhanced flange package, the MAPC-A3029-AD provides superior performance under pulsed operation allowing customers to improve SWaP-C benchmarks in their next generation systems.

Functional Schematic



Typical RF Performance:

- Pulse width of 100 µsec and 10% duty, P_{IN} = 28 dBm, V_{DS} = 65 V, I_{DQ} = 125 mA, T_C = 25°C

Frequency (GHz)	Output Power (dBm)	Gain (dB)	η_D (%)
1.2	47.4	19.4	60
1.3	47.6	19.6	63
1.4	47.4	19.4	64

Pin Configuration

Pin #	Pin Name	Function
2,3,4,5	RF_{IN} / V_G	RF Input / Gate
8,9,10,11	RF_{OUT} / V_D	RF Output / Drain
1,6,7,12,13	Flange[1]	Ground / Source

1. The flange on the package bottom must be connected to RF, DC and thermal ground.

Ordering Information

Part Number	MOQ Increment
MAPC-A3029-AD000	Bulk
MAPC-A3029-ADTR1	Tape and Reel
MAPC-A3029-ADSB1	Sample Board

* Restrictions on Hazardous Substances, compliant to current RoHS EU directive.

RF Electrical Characteristics in Evaluation Fixture

Freq. = 1.2 - 1.4 GHz, T_C = 25°C, V_{DS} = 65 V, I_{DQ} = 125 mA, Pulse Width = 100 µs, Duty Cycle = 10%

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Units
Output Power	Pulsed, P_{IN} = 28 dBm	P_{OUT}	-	47.6	-	dBm
Drain Efficiency	Pulsed, P_{IN} = 28 dBm	DE	-	63	-	%
Large Signal Gain	Pulsed, P_{IN} = 28 dBm	G_P	-	19.6	-	dB
Small Signal Gain	CW, P_{IN} = -20 dBm	S21	-	24	-	dB
Input Return Loss	CW, P_{IN} = -20 dBm	S11	-	-8	-	dB
Output Return Loss	CW, P_{IN} = -20 dBm	S22	-	-6	-	dB
Output Mismatch Stress	V_{DD} = 65 V, I_{DQ} = 125 mA, P_{IN} = 28 dBm	ψ	VSWR = 10:1; No Damage			

RF Electrical Specifications in Production Test Fixture[2]

Freq. = 1.2 GHz, P_{IN} = 28.5 dBm, T_A = +25°C, V_{DS} = 65 V, I_{DQ} = 125 mA,
Pulse Width 25 µs, 2% Duty Cycle

Parameter	Conditions	Symbol	Min.	Typ.	Max.	Units
Output Power	Pulsed, V_{DD} = 65 V, I_{DQ} = 125 mA, P_{IN} = 28 dBm	P_{OUT}	50.0	52.7	-	W
Drain Efficiency	Pulsed, V_{DD} = 65 V, I_{DQ} = 125 mA, P_{IN} = 28 dBm	η	61.0	63.0	-	%
Power Gain	Pulsed, V_{DD} = 65 V, I_{DQ} = 125 mA, P_{IN} = 28 dBm	G_P	18.5	18.7	-	dB

2. Final testing and screening for all transistor sales is performed using the MAPC-A3029-AD production test fixture at 1.2 GHz.

DC Electrical Characteristics T_A = 25°C

Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Units
Drain-Source Leakage Current	V_{GS} = -8 V, V_{DS} = 10 V	I_{DLK}	-	-	0.723	mA
Gate-Source Leakage Current	V_{GS} = -8 V, V_{DS} = 10 V	I_{GLK}	-0.723	-	-	mA
Gate Threshold Voltage	V_{DS} = 10 V, I_D = 5.2 mA	V_T	-3.8	-3.1	-2.3	V
Gate Quiescent Voltage	V_{DS} = 65 V, I_D = 125 mA	V_{GSQ}	-	-2.5	-	V

Thermal Characteristics

Parameter	Symbol	Test Conditions	Units	Rating
Operating Junction Temperature	T_J	Pulse Width = 100 µs , Duty Cycle = 10%, P_{DISS} = 32 W, T_C = 85°C	°C	120
Thermal Resistance, Junction to Case	$R_{\theta JC}$		°C/W	1.10

Parameter	Symbol	Test Conditions	Units	Rating
Operating Junction Temperature	T_J	Pulse Width = 2000 µs , Duty Cycle = 20%, P_{DISS} = 32 W, T_C = 85°C	°C	172
Thermal Resistance, Junction to Case	$R_{\theta JC}$		°C/W	2.66

Absolute Maximum Ratings[3,4]

Parameter	Absolute Maximum
Drain-Source Voltage	150 V
Gate Voltage	-10 +2 V
Drain Current	4.2 A
Gate Current	5.2 mA
Input Power	31 dBm
Storage Temperature	-65°C to +150°C
Mounting Temperature	+245°C
Junction Temperature[5]	+225°C
Operating Temperature	-40°C to +85°C

3. Exceeding any one or combination of these limits may cause permanent damage to this device.
4. MACOM does not recommend sustained operation near these survivability limits.
5. Operating at nominal conditions with $T_J \leq$ +225°C will ensure MTTF > 1×10^6 hours.

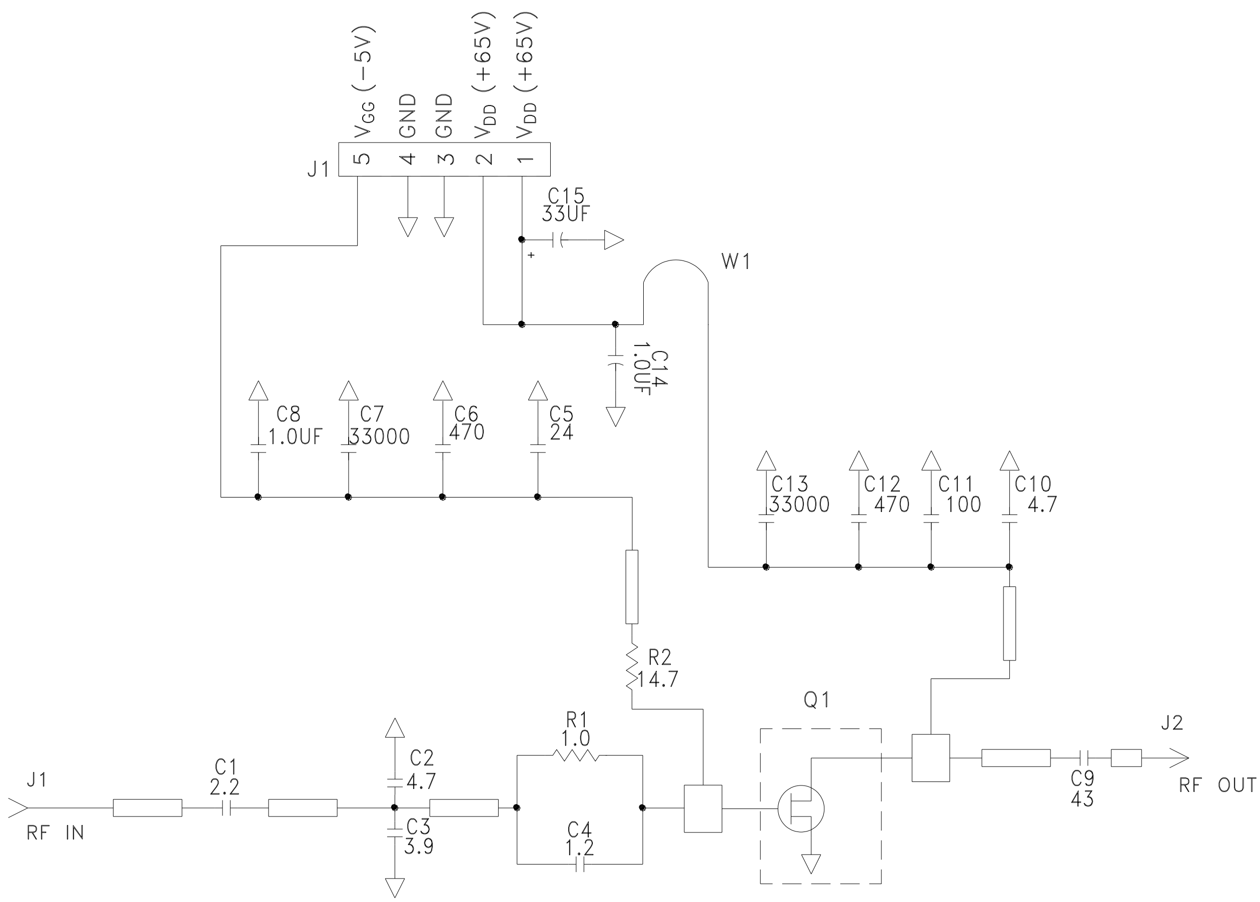
Handling Procedures

Please observe the following precautions to avoid damage:

Static Sensitivity

These electronic devices are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.

Evaluation Test Fixture and Recommended Tuning Solution, 1.2 - 1.4 GHz



Description

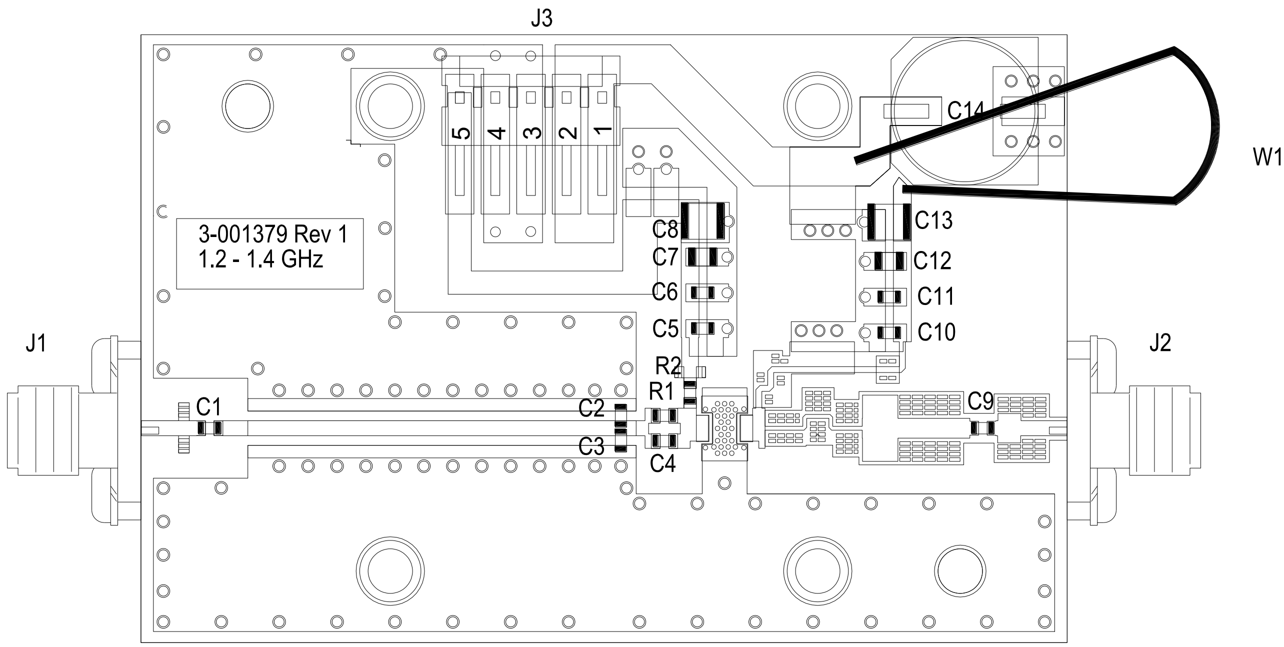
Parts measured on evaluation board (20-mil thick RO4350B). Matching is provided using a combination of lumped elements and transmission lines as shown in the simplified schematic above. Recommended tuning solution component placement, transmission lines, and details are shown on the next page.

Biasing Sequence

Bias ON
1. Ensure RF is turned off
2. Apply pinch-off voltage of -5 V to the gate
3. Apply nominal drain voltage
4. Bias gate to desired quiescent drain current
5. Apply RF

Bias OFF
1. Turn RF off
2. Apply pinch-off voltage of -5 V to the gate
3. Turn-off drain voltage
4. Turn-off gate voltage

Evaluation Test Fixture and Recommended Tuning Solution, 1.2 - 1.4 GHz



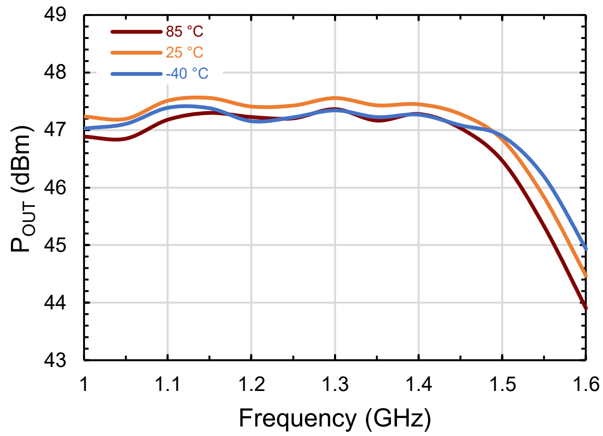
Assembly Parts List

Ref Des.	Description	Qty	Manufacturer	Manufacturer PN
C1	CAP, 2.2 pF, +/-0.1pF, 0603	1	AVX	600S2R2BT250XT
C2, C10	CAP, 4.7 pF, +/-0.1pF, 0603	2	AVX	600S4R7BT250XT
C3	CAP, 3.9 pF, +/-0.1pF, 0603	1	AVX	600S3R9CT250XT
C4	CAP, 1.2 pF, +/-0.1pF, 0603	1	AVX	600S1R2BT250XT
C5	CAP, 24 pF, +/-5%, 0603	1	AVX	600S240JT250XT
C6,C12	CAP, 470 pF, 5%,100V, 0603	2	Murata	GCM1885C2A471JA16
C7,C13	CAP, 33000 pF, 0805,100V, X7R	2	Murata	GRM21BR72A333KA01
C8,C14	CAP, 1 µF, 100V, 10%, X7R, 1210	2	Murata	GCJ31CR72A105KA01
C9	CAP, 43 pF, +/-5%pF, 0603	1	AVX	600S430FW250XT
C11	CAP, 100 pF, +/-5%, 0603	1	AVX	600S101FT250XT
C15	CAP, 33 µF, 20%, G CASE	1	Panasonic	EEE-FK2A330P
R1	RES, 1 Ω, 1/16W 5% 0603	1	Vishay	CRCW06031R00FKEA
R2	RES,14.7 Ω, 1/16W 1% 0603	1	Vishay	CRCW060314R7FKEA
J1,J2	SMA, PANEL MOUNT, FLANGE, 4-HOLE, BLUNT POST	2	Amphenol	132150
J3	HEADER RT>PLZ .1CEN LK 5POS	1	AMP, INC	640457-5
PCB	Roger RO4350B, 20 mils, 2 oz Cu			
Q1	MACOM GaN Power Transistor			MAPC-A3029-AD
W1	Wire, 20 AWG, 4"	1	Remington	MIL-W-16878

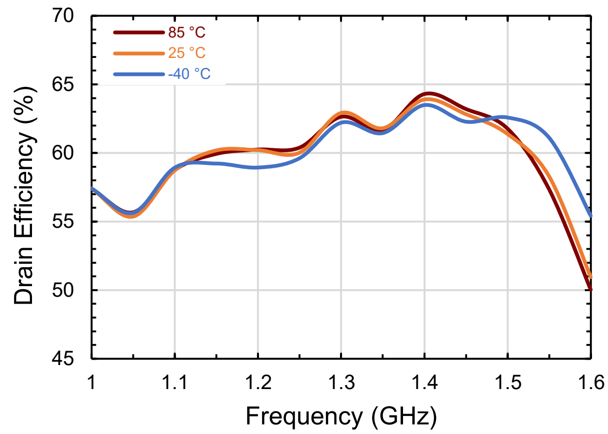
Typical Performance Curves as Measured in the 1.2– 1.4 GHz Evaluation Test Fixture

Pulse Width = 100 μsec, Duty Cycle = 10%,Pin = 28 dBm, V_{DS} = 65 V, I_{DQ} = 125 mA, Frequency = 1.3 GHz (Unless Otherwise Noted). For Engineering Evaluation Only – This data does not Modify MACOM's Datasheet Limits.

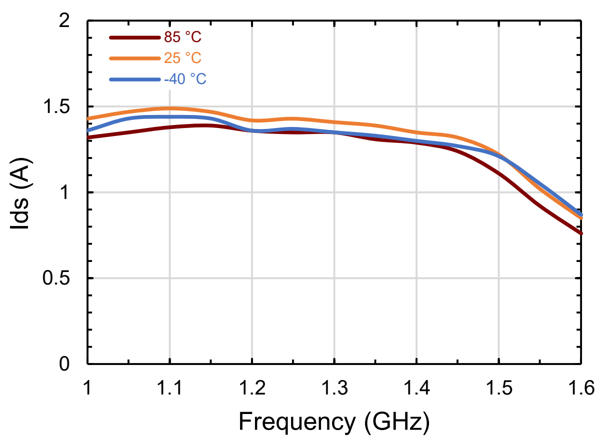
Output Power vs. Temperature and Frequency



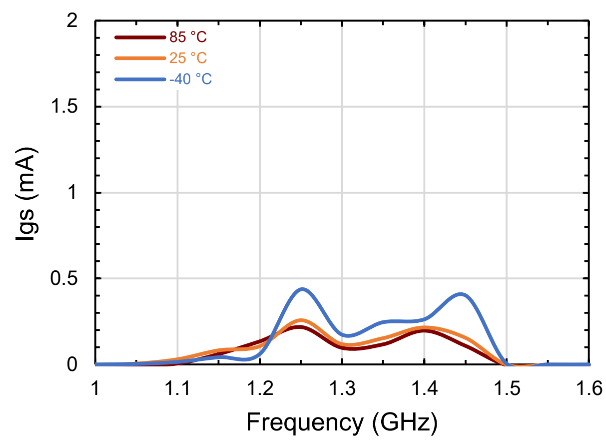
Drain Efficiency vs. Temperature and Frequency



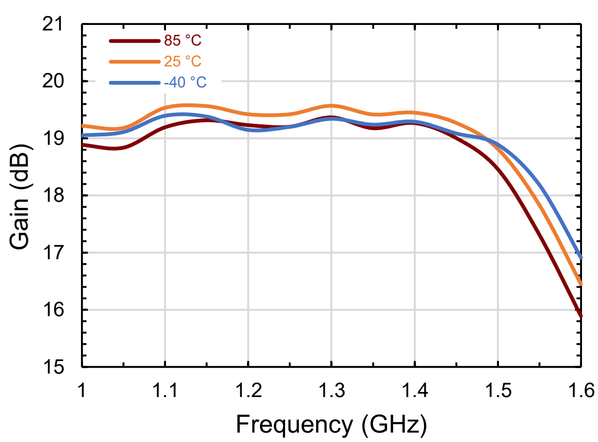
Drain Current vs. Temperature and Frequency



Gate Current vs. Temperature and Frequency



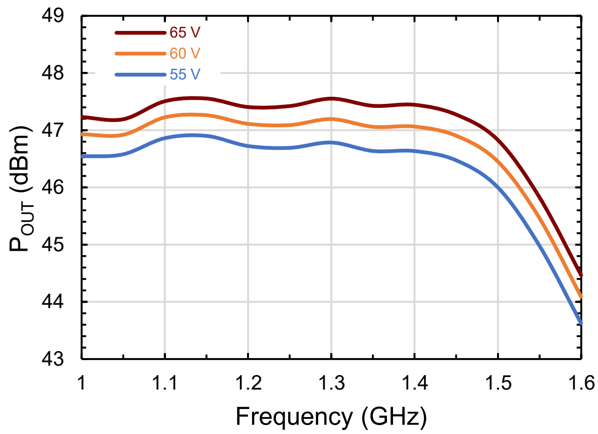
Large Signal Gain vs. Temperature and Frequency



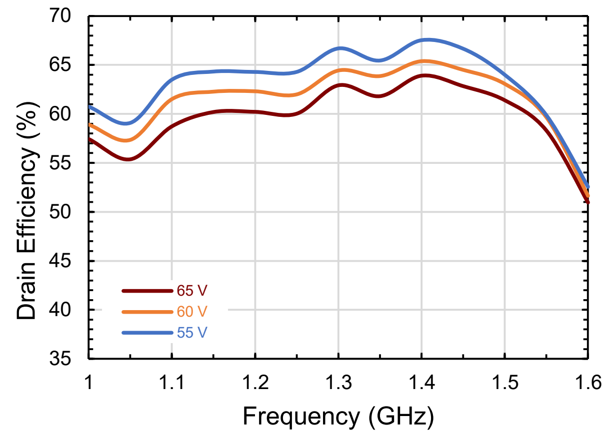
Typical Performance Curves as Measured in the 1.2– 1.4 GHz Evaluation Test Fixture

Pulse Width = 100 µsec, Duty Cycle = 10%,Pin = 28 dBm, V_{DS} = 65 V, I_{DQ} = 125 mA, Frequency = 1.3 GHz (Unless Otherwise Noted). For Engineering Evaluation Only – This data does not Modify MACOM's Datasheet Limits.

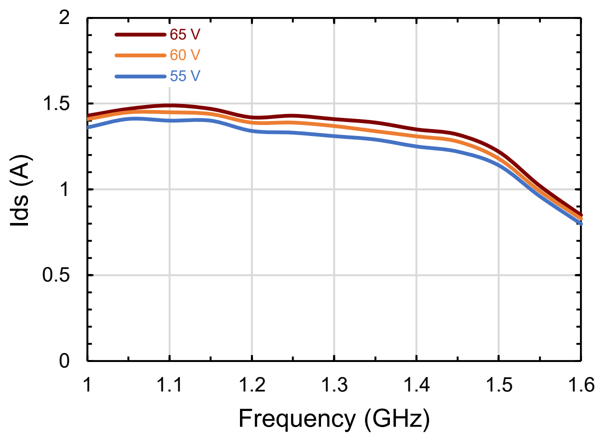
Output Power vs. V_{DS} and Frequency



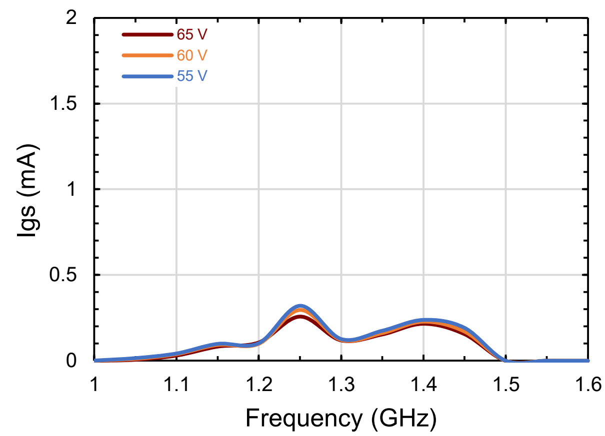
Drain Efficiency vs. V_{DS} and Frequency



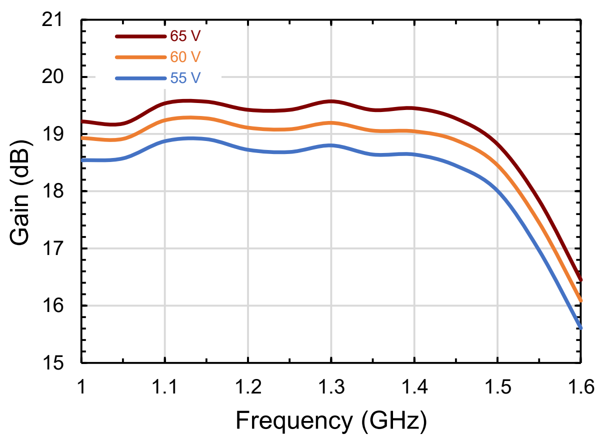
Drain Current vs. V_{DS} and Frequency



Gate Current vs. V_{DS} and Frequency



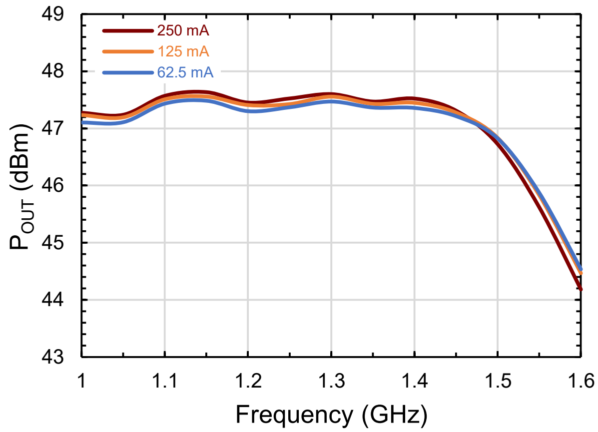
Large Signal Gain vs. V_{DS} and Frequency



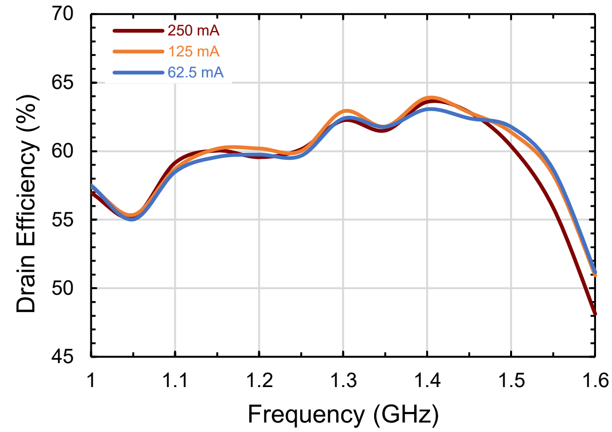
Typical Performance Curves as Measured in the 1.2– 1.4 GHz Evaluation Test Fixture

Pulse Width = 100 µsec, Duty Cycle = 10%,Pin = 28 dBm, V_{DS} = 65 V, I_{DQ} = 125 mA, Frequency = 1.3 GHz (Unless Otherwise Noted). For Engineering Evaluation Only – This data does not Modify MACOM's Datasheet Limits.

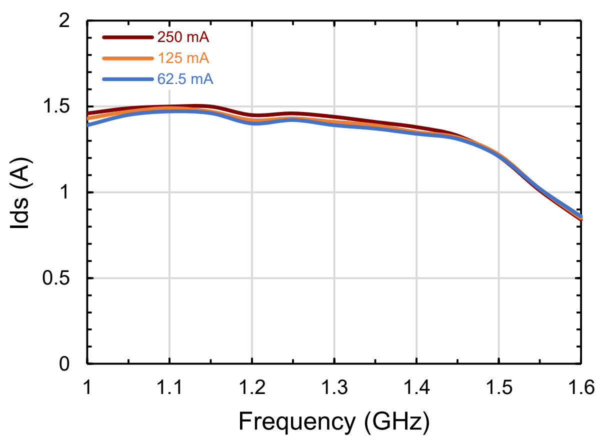
Output Power vs. I_{DQ} and Frequency



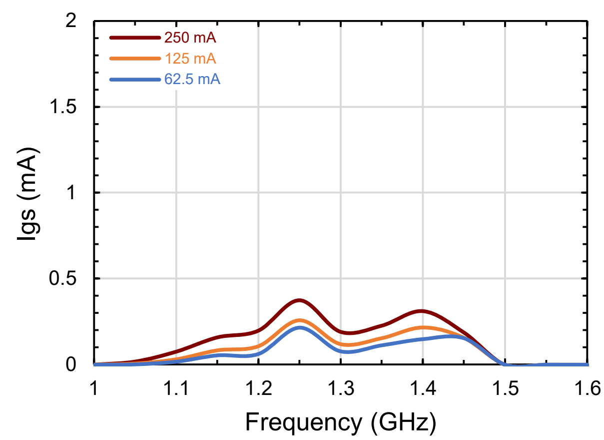
Drain Efficiency vs. I_{DQ} and Frequency



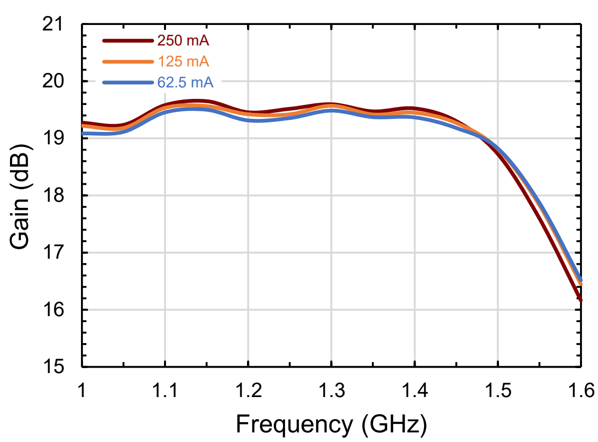
Drain Current vs. I_{DQ} and Frequency



Gate Current vs. I_{DQ} and Frequency



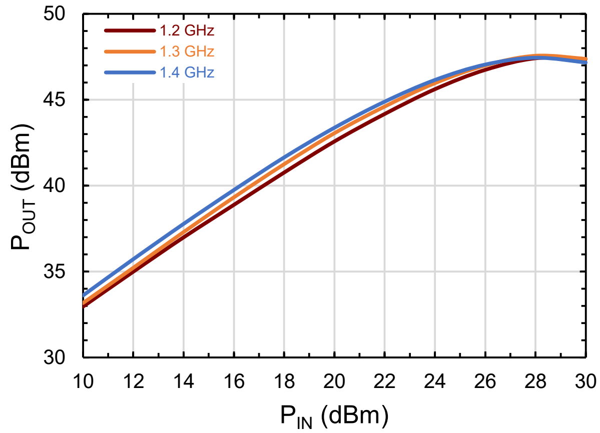
Large Signal Gain vs. I_{DQ} and Frequency



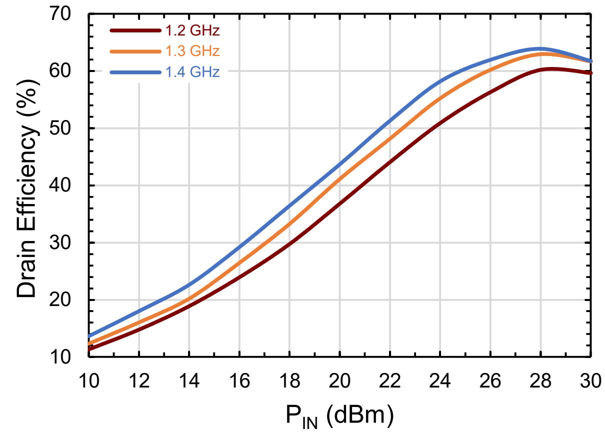
Typical Performance Curves as Measured in the 1.2– 1.4 GHz Evaluation Test Fixture

Pulse Width = 100 µsec, Duty Cycle = 10%,Pin = 28 dBm, V_{DS} = 65 V, I_{DQ} = 125 mA, Frequency = 1.3 GHz (Unless Otherwise Noted). For Engineering Evaluation Only – This data does not Modify MACOM's Datasheet Limits.

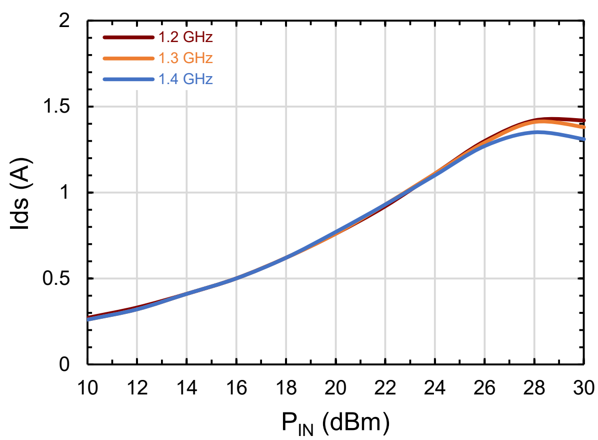
Output Power vs. Frequency and P_{IN}



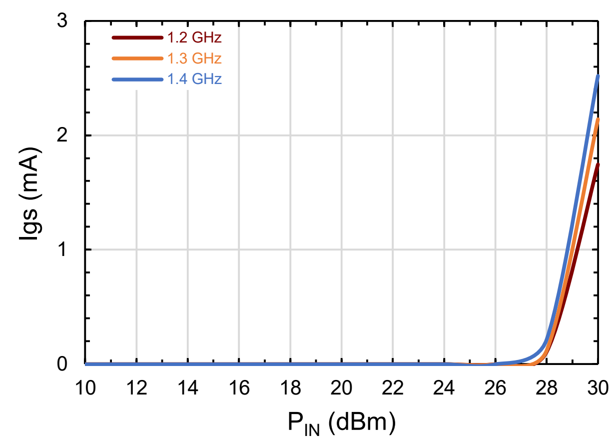
Drain Efficiency vs. Frequency and P_{IN}



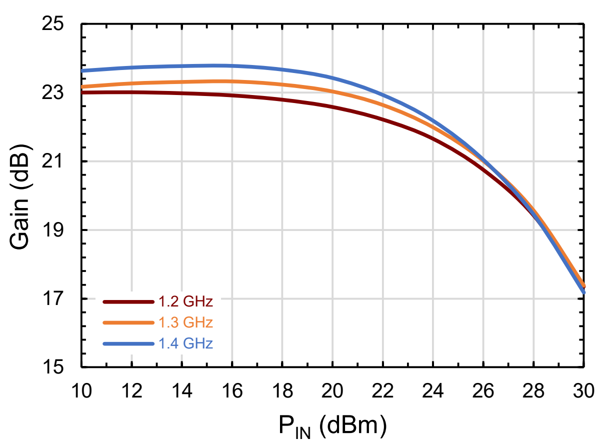
Drain Current vs. Frequency and P_{IN}



Gate Current vs. Frequency and P_{IN}



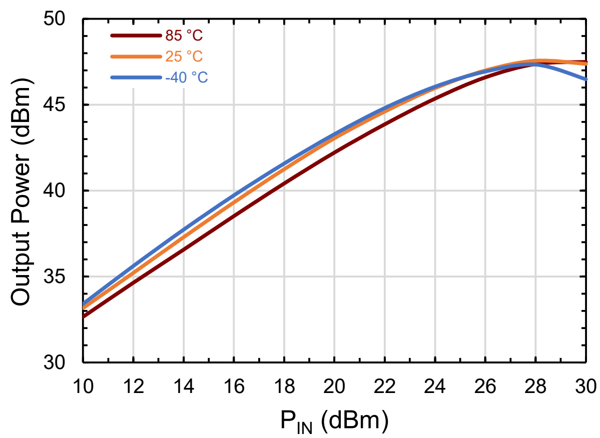
Large Signal Gain vs. Frequency and P_{IN}



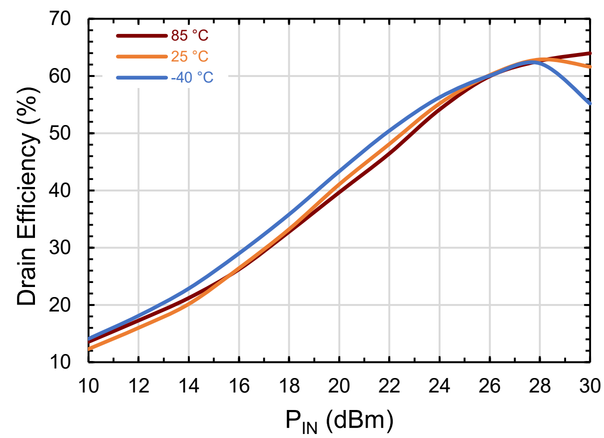
Typical Performance Curves as Measured in the 1.2– 1.4 GHz Evaluation Test Fixture

Pulse Width = 100 µsec, Duty Cycle = 10%,Pin = 28 dBm, V_{DS} = 65 V, I_{DQ} = 125 mA, Frequency = 1.3 GHz (Unless Otherwise Noted). For Engineering Evaluation Only – This data does not Modify MACOM's Datasheet Limits.

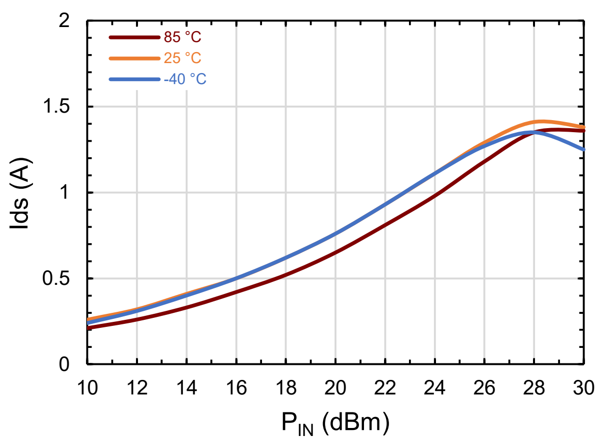
Output Power vs. Temperature and P_{IN}



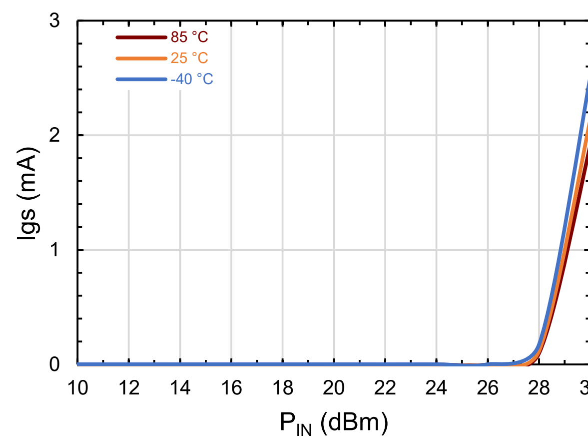
Drain Efficiency vs. Temperature and P_{IN}



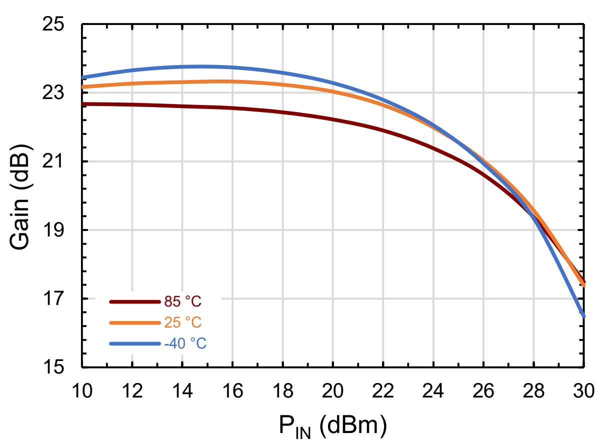
Drain Current vs. Temperature and P_{IN}



Gate Current vs. Temperature and P_{IN}



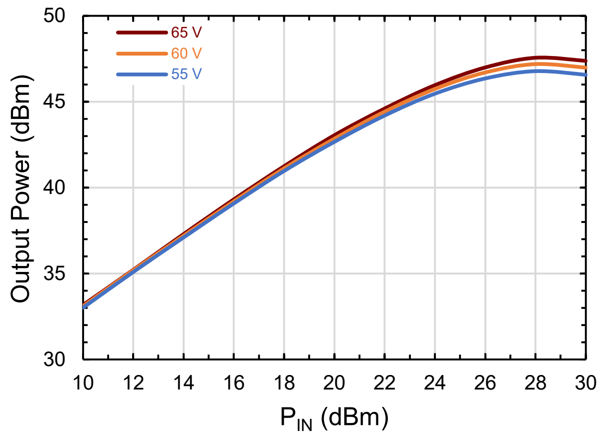
Large Signal Gain vs. Temperature and P_{IN}



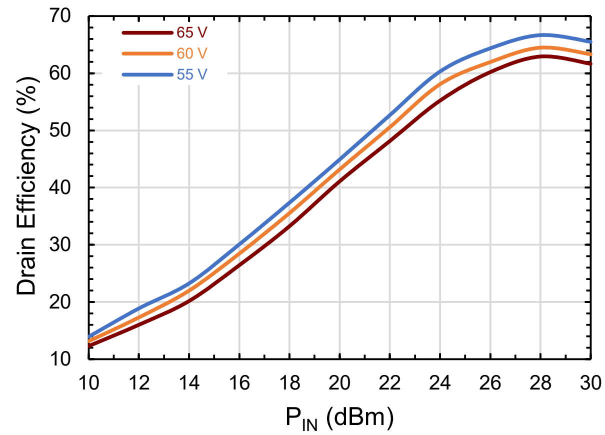
Typical Performance Curves as Measured in the 1.2– 1.4 GHz Evaluation Test Fixture

Pulse Width = 100 µsec, Duty Cycle = 10%,Pin = 28 dBm, V_{DS} = 65 V, I_{DQ} = 125 mA, Frequency = 1.3 GHz (Unless Otherwise Noted). For Engineering Evaluation Only – This data does not Modify MACOM's Datasheet Limits.

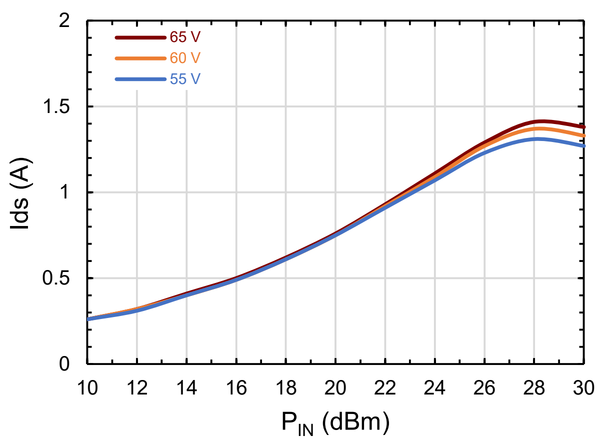
Output Power vs. V_{DS} and P_{IN}



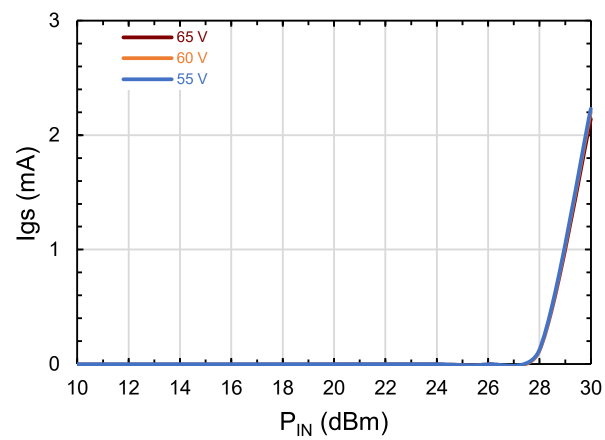
Drain Efficiency vs. V_{DS} and P_{IN}



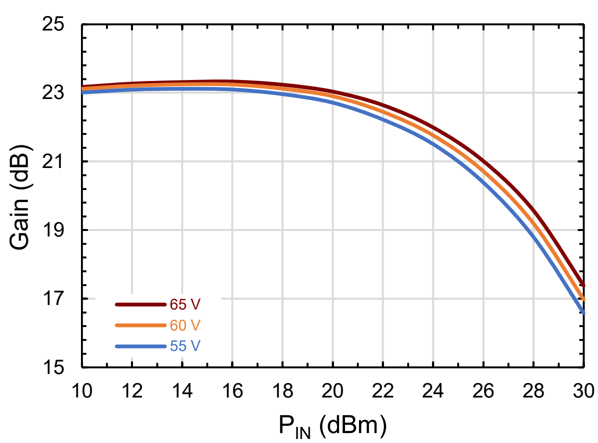
Drain Current vs. V_{DS} and P_{IN}



Gate Current vs. V_{DS} and P_{IN}



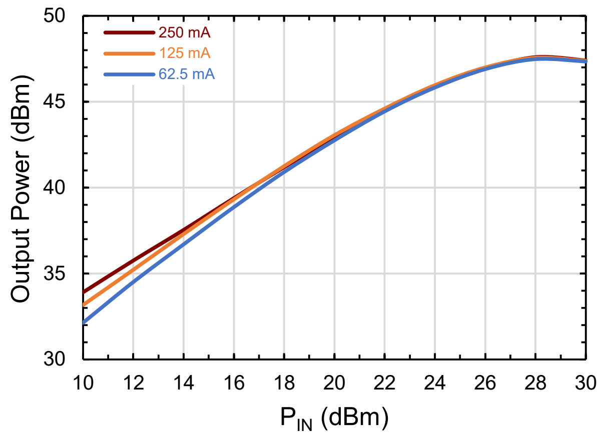
Large Signal Gain vs. V_{DS} and P_{IN}



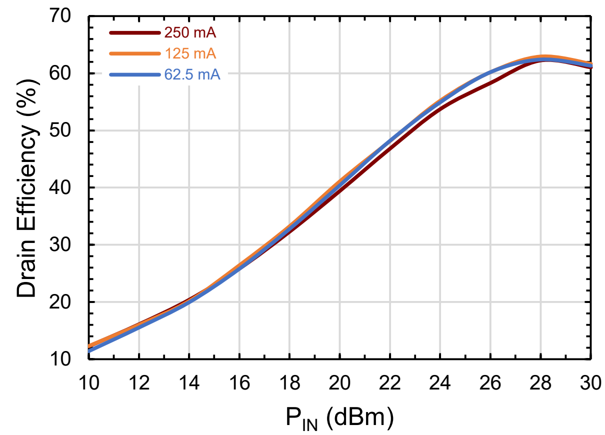
Typical Performance Curves as Measured in the 1.2– 1.4 GHz Evaluation Test Fixture

Pulse Width = 100 µsec, Duty Cycle = 10%,Pin = 28 dBm, V_{DS} = 65 V, I_{DQ} = 125 mA, Frequency = 1.3 GHz (Unless Otherwise Noted). For Engineering Evaluation Only – This data does not Modify MACOM's Datasheet Limits.

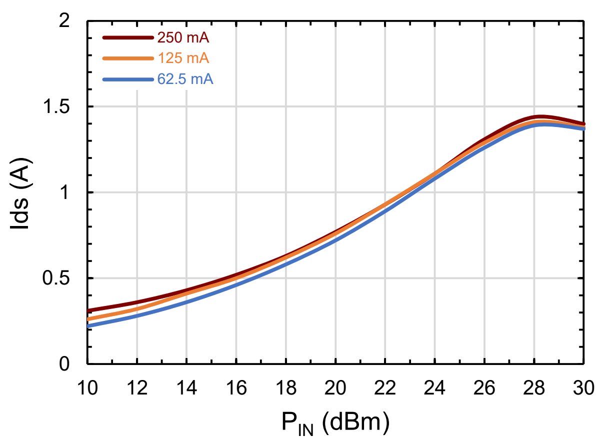
Output Power vs. I_{DQ} and P_{IN}



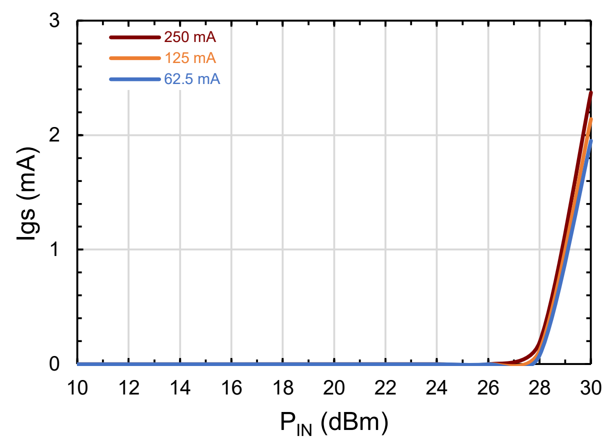
Drain Efficiency vs. I_{DQ} and P_{IN}



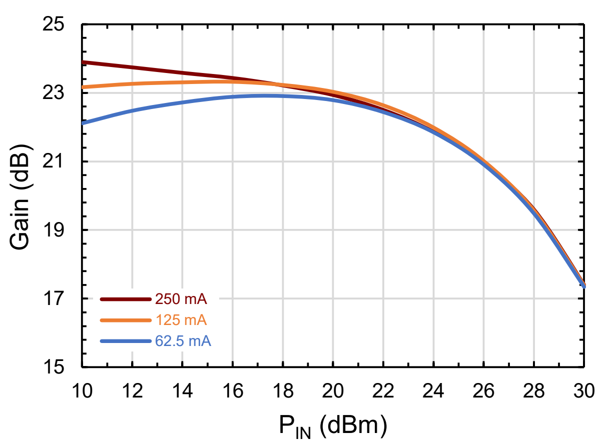
Drain Current vs. I_{DQ} and P_{IN}



Gate Current vs. I_{DQ} and P_{IN}



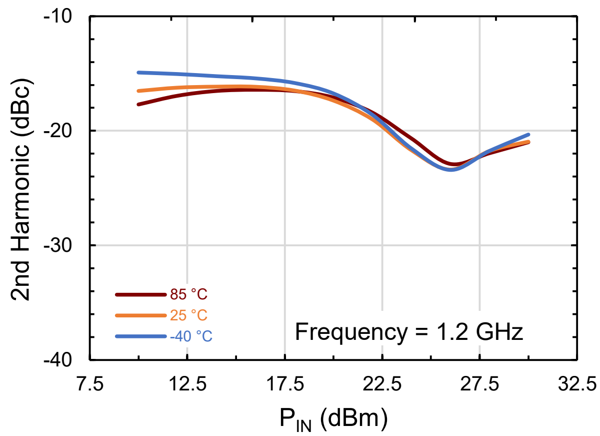
Large Signal Gain vs. I_{DQ} and P_{IN}



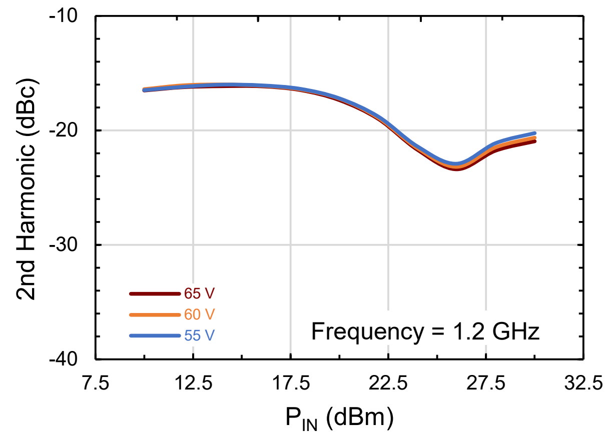
Typical Performance Curves as Measured in the 1.2– 1.4 GHz Evaluation Test Fixture

Pulse Width = 100 µsec, Duty Cycle = 10%,Pin = 28 dBm, V_{DS} = 65 V, I_{DQ} = 125 mA, Frequency = 1.3 GHz (Unless Otherwise Noted). For Engineering Evaluation Only – This data does not Modify MACOM's Datasheet Limits.

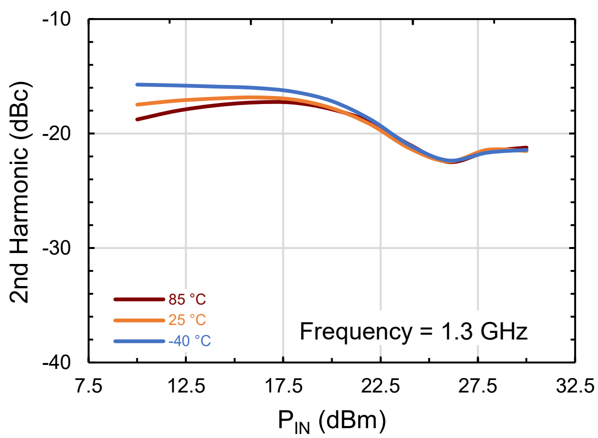
2nd Harmonic vs. Temperature and P_{IN}



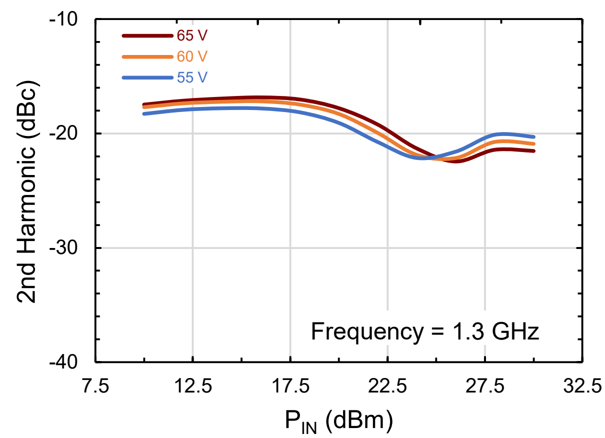
2nd Harmonic vs. V_{DS} and P_{IN}



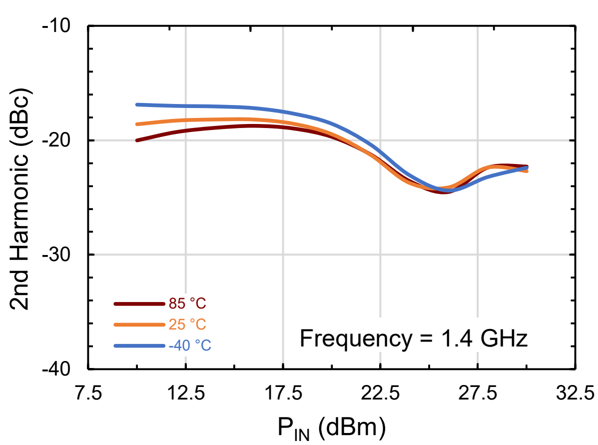
2nd Harmonic vs. Temperature and P_{IN}



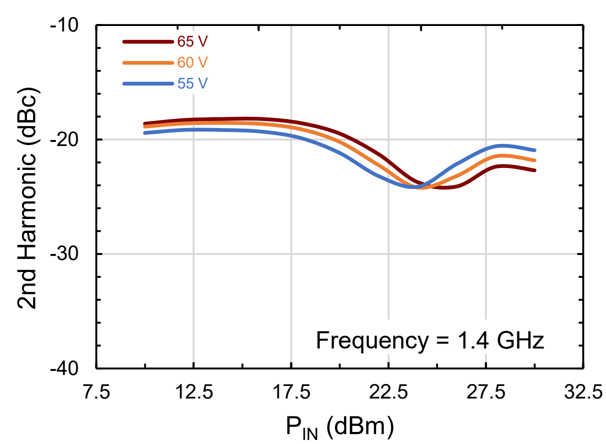
2nd Harmonic vs. V_{DS} and P_{IN}



2nd Harmonic vs. Temperature and P_{IN}



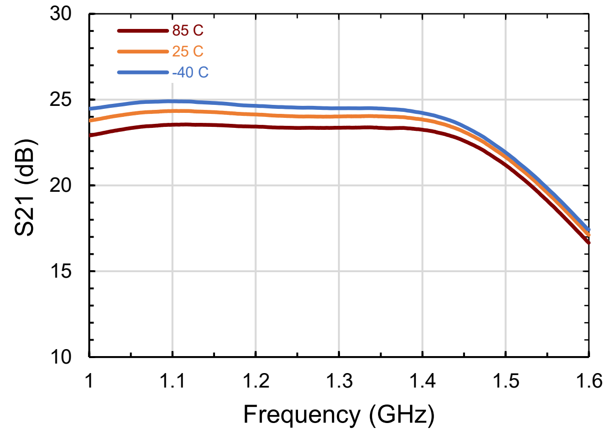
2nd Harmonic vs. V_{DS} and P_{IN}



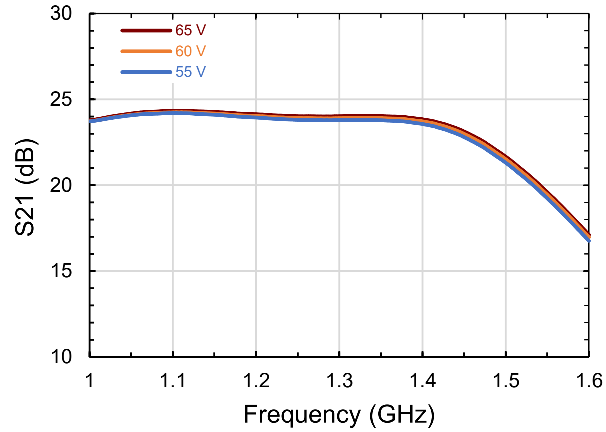
Typical Performance Curves as Measured in the 1.2 - 1.4 GHz Evaluation Test Fixture:

CW, V_{DS} = 65V, I_{DQ} = 125 mA, Pin=-20dBm
For Engineering Evaluation Only—This data does not Modify MACOM's Datasheet Limits.

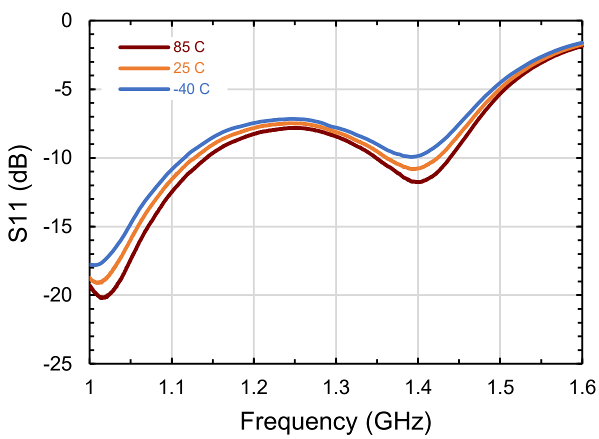
S21 vs Frequency and Temperature



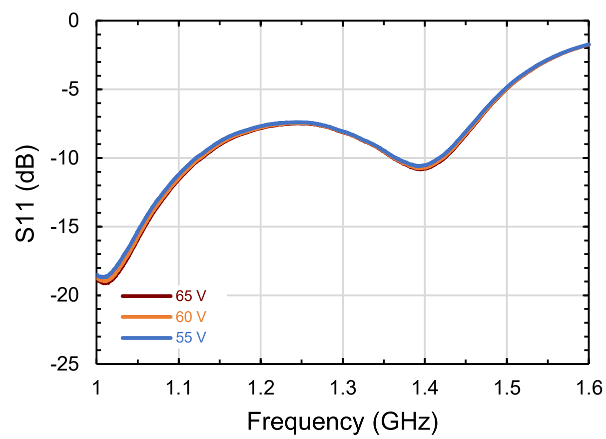
S21 vs Frequency and V_{DS}



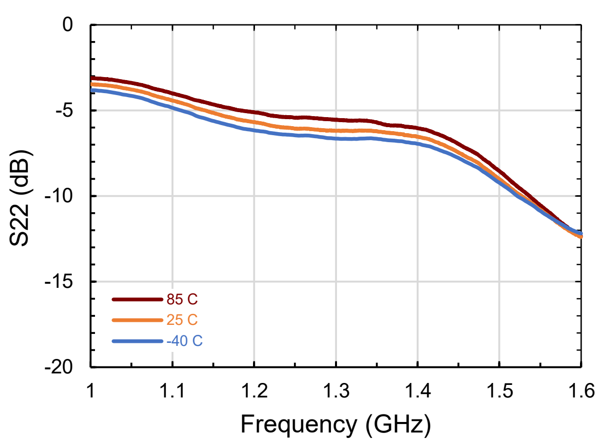
S11 vs Frequency and Temperature



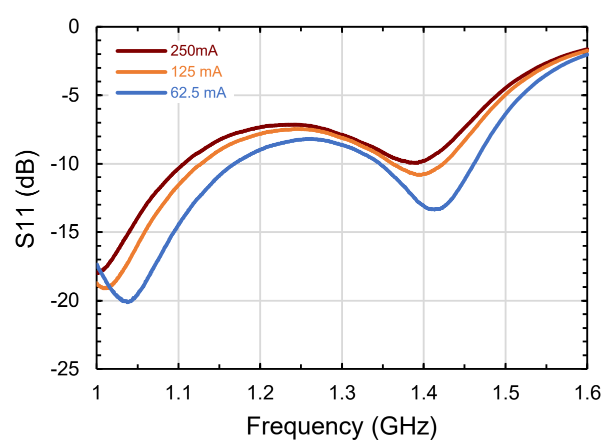
S11 vs Frequency and V_{DS}



S22 vs Frequency and Temperature



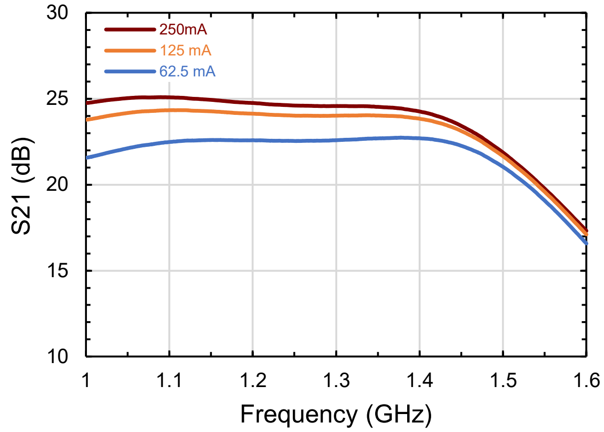
S22 vs Frequency and V_{DS}



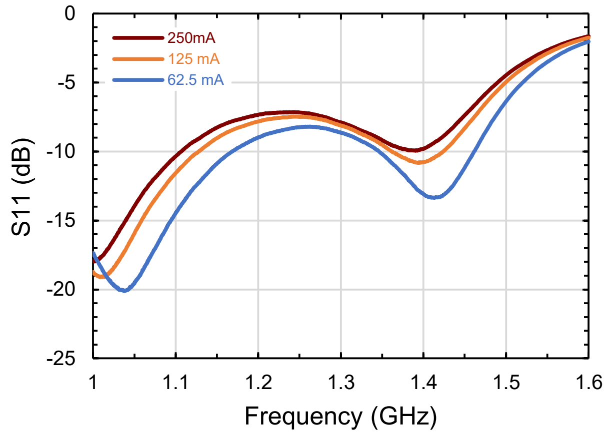
Typical Performance Curves as Measured in the 1.2 - 1.4 GHz Evaluation Test Fixture:

CW, V_{DS} = 65V, I_{DQ} = 125 mA, Pin=-20dBm
For Engineering Evaluation Only—This data does not Modify MACOM's Datasheet Limits.

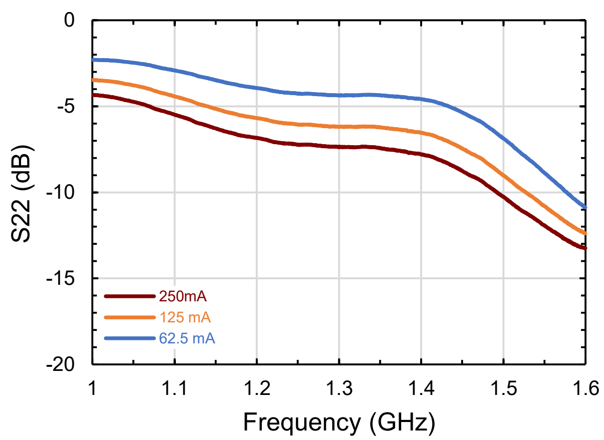
S21 vs Frequency and I_{DQ}



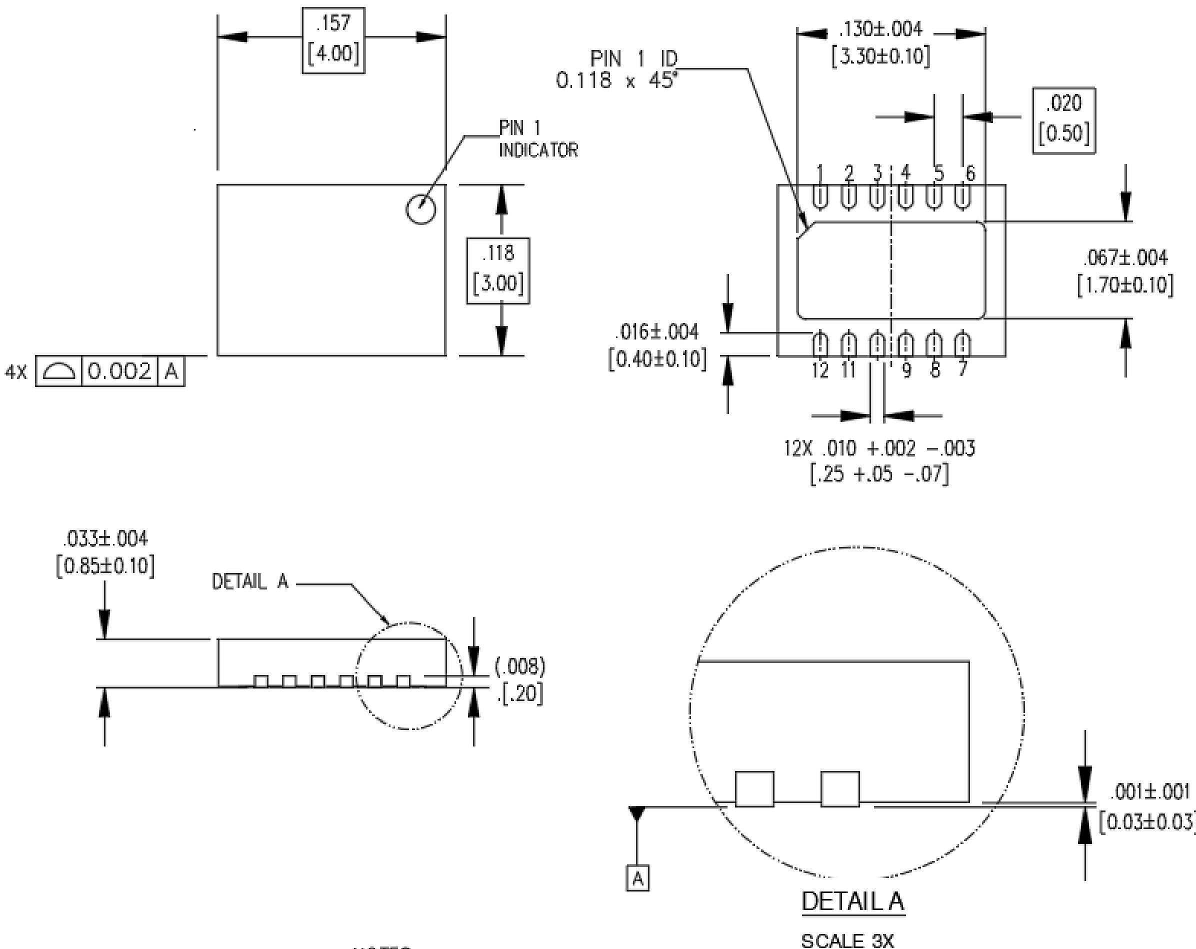
S11 vs Frequency and I_{DQ}



S22 vs Frequency and I_{DQ}



3 x 4 mm PDFN-12L Package Dimensions



NOTES:

1. ALL DIMENSIONS SHOWN AS in[mm]. CONTROLLING DIMENSIONS ARE IN in. CONVERTED mm DIMENSIONS ARE NOT NECESSARILY EXACT.
2. EXPOSED LEADS 100% Sn MATTE.